CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
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EP-7100-7

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TRANSMISSION PLANNING CRITERIA

PURPOSE

This specification describes Con Edison's transmission planning criteria for assessing the adequacy of its transmission system to withstand design contingency conditions while providing reliable supply to all its customers, throughout the planning horizon. This specification is not intended to provide a guideline for the determination of transfer limits into, nor within, the Con Edison system. The transfer limits assessment is the responsibility of the New York Independent System Operator (NYISO), and it is performed as a critical part of the NYISO process, with the participation of all New York Control Area (NYCA) market participants, including Con Edison.

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1.0 Fundamental Design Principles

The Con Edison transmission system is planned in accordance with the following fundamental design principles, which are applicable to all new projects proposed by the Company and independent developers. Any exception to these principles must be approved by the Chief Engineers of Transmission Planning and Electrical Engineering.

1.1 New generation and transmission facilities shall not require the interruption of any transmission path (for example by opening circuit breakers).

1.2 Interconnection plans for new generators and transmission lines shall satisfy the need for adequate station diversity recognizing that an acceptable configuration may require the relocation of existing feeders. For example, this design principle requires alternating supply and load feeders in substation design.

1.3 A single event (e.g. breaker failure) will not result in the outage of multiple supply sources (generation or transmission) into a Transmission Load Area.

1.4 The loss of any single feeder will not result in the outage of multiple bus sections.

1.5 New generation and transmission facilities proposing to interconnect to an existing transmission substation shall do so in a manner consistent with the design basis established by Con Edison for that substation, i.e., ring bus, double ring bus, or breaker-and-a-half. The new interconnection shall not compromise the basic design concepts inherent in these configurations. For example, transmission feeders shall not be connected to the syn buses of a breaker-and-a-half configuration.

1.6 New generation and transmission facilities proposing to interconnect to an existing transmission feeder shall require the construction of a new substation with the appropriate breaker configuration at the point of interconnection to maintain system reliability. In the case where the existing transmission feeder is one of multiple feeders with common terminals, then all such transmission feeders shall be incorporated into the design of the new substation to prevent the interconnection from causing an imbalance in the power flow distribution.

1.7 Interconnection plans for new generators and transmission lines shall be designed to ensure system reliability, and as such shall comply with basic substation reliability design. For example, interconnection plans will avoid overhead crossings of other feeders and associated substation bus sections, provide adequate separation and when necessary independent routing of underground feeders, provide separation of control and relay protection wiring, etc.

1.8 Con Edison shall not be obligated to supply or absorb reactive power for entities interconnecting transmission systems (new or modified interconnections) with Con Edison's transmission system. Such entities shall supply the additional reactive power requirements attributable to such interconnection to ensure reactive power neutrality at the point of interconnection to the Con Edison transmission system, except as otherwise mutually agreed. These requirements are applicable to normal system conditions, as well as steady-state conditions resulting from design criteria contingencies described in the New York State Reliability Council (NYSRC) *Reliability Rules for Planning and Operating the New York State Power System*.

1.9 All equipment on the transmission system, including but not limited to circuit breakers, bus work, disconnect switches, and structural supports, shall withstand the mechanical forces associated with fault currents.

1.10 The harmonic voltage or current distortion created by any interconnecting facility must not exceed the fundamental 60 Hz voltage or current waveform limits as identified in IEEE Standard 519.

1.11 In addition to this criteria document (EP-7100), all facilities, generator and transmission, must be designed to conform with and adhere to all applicable NERC, NPCC, NYSRC reliability rules including NYSRC local reliability rules, as well as applicable Con Edison specifications, procedures and guidelines.

2.0 Performance Criteria

2.1 Con Edison's Transmission Load Areas are designed as follows:

- Those supplied by the 345 kV transmission system are designed for second contingency;
- Specific 138 kV Transmission Load Areas are also designed for second contingency; and
- The remaining 138 kV Transmission Load Areas are designed for single contingency.

Attachment I identifies the Transmission Load Areas with their designation as first or second contingency design.

Second contingency design means that the Con Edison transmission system is planned to withstand, at peak design customer demand, the more severe of independent Scenarios A and B, as described below:

A. The most severe of design criteria contingencies of type "a" through "g", per Table A of the NYSRC Reliability Rules.

B. The most severe combination of two non-simultaneous design criteria contingencies of type "a" and "d", per Table A of the NYSRC Reliability Rules.

For single contingency testing (Scenario A), applicable post-contingency thermal, voltage and stability limits shall not be exceeded. In addition, the system must be able to be returned to within its normal state limits using all available operating reserves and system controls.

For second contingency testing (Scenario B), applicable post-contingency thermal, voltage and stability limits shall not be exceeded. Prior to testing for the second contingency, the system should be able to be returned to its normal state limits utilizing 10 minute operating reserves and system controls. In addition, after the second contingency has occurred, the system must be returned to within its normal state limits using all available operating reserves and system controls.

Second contingency design, as it relates to the transmission system, is implemented upon the Company's due consideration of all applicable critical factors, such as:

- Forecasted changes in load growth and patterns;
- Projected DSM programs;
- Operational margins above and beyond single contingency design;
- Merchant projects; and
- Comprehensive impact of transmission upgrades above and beyond single contingency design.

Con Edison transmission system performance criteria are consistent with the NYSRC, NPCC and NERC criteria. The performance of the system both during a contingency event, as well as in the new operating state following any such event, will be planned to meet the performance assessment criteria detailed below.

2.2 The performance assessment of the Con Edison transmission system requires the evaluation of voltage, thermal, stability, subtransient, and short circuit performance of the system with all facilities in service, as well as under the contingency conditions described in Section 2.1. These analyses are further detailed below.

3.0 Voltage Assessment

3.1 NYCA members operate their transmission facilities within the voltage limits stated in Table A-3 of the NYISO *Emergency Operations Manual*.

These limits are applicable to both steady state and contingency conditions.

3.2 Voltages must satisfy both steady-state and post-contingency limits, as follows:

Minimum: 328 kV < Actual 345 kV system < Maximum: 362 kV
Minimum: 131 kV < Actual 138 kV system < Maximum: 145 kV

4.0 Thermal Assessment

4.1 The Con Edison thermal planning criteria, expressed in ampere carrying capacity, consider three thermal categories. These are:

- Normal (N) ampacity loading;
- Long-Term Emergency (LTE) ampacity loading; and
- Short-Term Emergency (STE) ampacity loading.

4.2 The post-contingency loading of any overhead facility or inter-utility tie must not exceed its LTE rating.

4.3 In observance of NYSRC *Reliability Rule B-R1b***,** the post-contingency loading of any underground cable can exceed its LTE rating, but not its STE rating, following:

- Loss of generation – provided that ten (10) minute operating reserve and/or phase angle regulation is available to reduce the loading to its LTE rating and not cause any other facility to be loaded beyond its LTE rating; and

- Loss of transmission – provided that phase angle regulation is available to reduce the loading to its LTE rating and not cause any other facility to be loaded beyond its LTE rating.

5.0 Stability Assessment

Unit and system stability shall be maintained during and following the more severe of independent scenarios A and B as identified in Section 2.1, with due regard to re-closing (per NPCC criteria).

6.0 Subtransient Conditions Assessment

As changes occur in the topography of the Con Edison transmission infrastructure, appropriate analysis is conducted to ensure that electrical equipment (e.g. circuit breakers, transformers) are protected against subtransient overvoltage and harmful resonance conditions caused by switching operations and/or potential contingency events.

7.0 Short Circuit Assessment

The Con Edison transmission system is planned such that, when all generation and all transmission facilities are in service, fault currents do not exceed the rated interrupting capability of breakers at all 69 kV, 138 kV, and 345 kV substations, in accordance with applicable ANSI standards.

8.0 Extreme Contingency Assessment

Extreme contingency assessment recognizes that the bulk power system can be subjected to events that exceed, in severity, the normal planning criteria. This assessment is conducted to determine the nature and potential extent of widespread system disturbances from such events and to identify measures that will be utilized, where appropriate, to reduce the frequency of occurrence of such events, or to mitigate the consequences that are indicated as a result of testing for such contingencies. Analytical studies shall be performed to determine the effect of the Extreme Contingencies as listed in Table B of the NYSRC Reliability Rules.

9.0 Underfrequency Load Shedding

As part of its requirements for operating its electric system during Major Emergencies, the Company's underfrequency load shedding system is designed to protect the service area from an imbalance between load and generation that occurs during system separation following events that exceed, in severity, the normal planning criteria. The NYSRC requires NYCA member systems to shed up to 25% of their load automatically, and at least 50% of their load manually within ten minutes. Above and beyond NYSRC requirements, Con Edison has the capability of automatically shedding approximately 50% of its load for underfrequency situations, and the capability of shedding manually, via SCADA control, 100% of its load.

10.0 System Restoration

The Con Edison restoration procedures consider multiple plans to restore the system after a total shutdown. The applicability of these plans is based on the availability of external tie feeders and external generation, as well as generation within the Con Edison service area. An essential aspect of restoration planning is the assessment of the adequacy of black start capacity (both gas turbines and steam turbines). Such an assessment is based both on the amount and location of black start capacity in consideration of the fact that transmission infrastructure integrity following a blackout is, largely, unpredictable.

ATTACHMENT I: TRANSMISSION LOAD AREAS

Transmission Load Area	**Design Contingency**
New York City 345/138 kV	Second
West 49th Street 345 kV	Second
New York City 138 kV	Second
Astoria 138 kV	Second
East 13th Street 138 kV	Second
Astoria East/Corona 138 kV	Second
Astoria West/Queensbridge 138 kV	Second
Vernon 138 kV	Second
East River 138 kV	Second
Greenwood/Staten Island 138 kV	First
Corona/Jamaica 138 kV	First
Bronx 138 kV	First
Eastview 138 kV	First
Staten Island 138 kV	First
Dunwoodie North/Sherman Creek 138 kV	First
Dunwoodie South 138 kV	First
Millwood/Buchanan 138 kV	First